ground in the midst of Islám, is referred to the beginning of the fifteenth century. But the fair state of preservation of this wooden image bespeaks a much more recent date.

On the concluding plates are figured numerous designs of bronze drums or gongs from every part of the Archipelago and Further India. These instruments, which play so large a part in the social economy of the Indonesian and Indo-Chinese peoples, are here brought together for the purpose of elucidating the obscure and hitherto little studied history of their origin and diffusion throughout South-Eastern Asia. Those interested in the subject will find much instructive matter embodied in the accompanying text.

A word of thanks is also due to Dr. Max Uhle, the Curator's able assistant, not only for his general cooperation, but more especially for the great care he has bestowed on the map of the regions in question. On it are accurately indicated all the places in Malaysia where Hindu antiquities have at any time been discovered, or where monuments dating from pre-Muhammadan times are found.

A. H. KEANE

OUR BOOK SHELF

The Antananarivo Annual and Madagascar Magazine, No. VIII. Christmas, 1884. (Antananarivo: Printed at the London Missionary Society's Press by Malagasy Printers.)

ALTHOUGH the previous number of this interesting periodical was, I believe, noticed in NATURE, I should like to call attention to the present issue, inasmuch as it is a token of the valuable scientific work which, amid great difficulties, is being bravely carried on by Christian missions in the sorely troubled island of Madagascar.

One of the editors of the *Annual*, the Rev. R. Baron, is an accomplished botanist, indefatigable in his efforts to explore the botany of his adopted home, and unwearied in his efforts to obtain materials for Mr. J. G. Baker and other workers at home; and his colleagues, no less than himself and his fellow editor, the Rev. J. Sibree, seem devoted to the double duty of teaching the Christian religion and civilisation to the Malagasy and of advancing our scientific knowledge of the strange land in which they are for the time being dwelling.

The present number, besides a spirited account of a Royal Kabary or coronation ceremony, contains valuable philological articles on the Malagasy pronouns, by the Rev. L. Dahle; on Malagasy dictionaries, by the Rev. W. E. Cousins; and on the want of new words in the Malagasy language and the way of supplying them, by the Rev. S. E. Jorgensen, the latter having a more than philological, indeed a personal, interest to scientific writers, who, like the Madagascar missionaries, are continually in "want of new words" and not always very judicious in their "way of supplying them." Articles on Malagasy superstitions, on the Sakaklava, and on Malagasy proverbs, contain much valuable matter for the anthropologist; while a paper on medical mission work, by a non-professional; an instructive critical exposure of a geographical fiction, by the Rev. L. Dahle; notes on natural history, by the Rev. R. Baron; a four years' record of rainfall, by the Rev. J. Richardson; and various notes, such as one recording the arrival, on Malagasy shores, of worn fragments of pumice-stone, supposed o be from Krakatoa, complete the number.

The technical printing does great credit to the native printers, for, though one German quotation has gone a little wrong, the press errors are otherwise exceedingly few.

I feel sure that I may bespeak the sympathy of the readers of NATURE with the *Antananarivo Annual*, and that we may look forward with confidence to much scientific as well as other fruit from the continued labours of the editors and their *confrères*.

M. FOSTER

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

The Forms of Leaves

I HAVE read Mr. Henslow's letter with interest; and of course any criticisms from him are worthy of all attention. At the same time I may observe that as yet he has only seen what may be called an abstract of an abstract. A Friday evening lecture is scarcely the occasion to work out a special statement in detail; but he is apparently criticising not even my lecture itself, but merely an abstract of it. He commences by saying that it is "self-evident" that the size of the leaf is regulated mainly by the thickness of the stem. This may be, but, so far as I am aware, the importance of this consideration had not been previously pointed out. Having, however, first disposed of my statement as "self-evident," he proceeds next to deny it altogether, and quotes cases in which the size of certain leaves bore no reference to the thickness of the stem. With regard to these, however, I must observe that I was referring to leaf-area, and as Mr. Henslow does not mention the number of leaves his illustration is incomplete. Moreover, as he was dealing merely with an abstract of what I said, he does not recognise the qualifications to which, in the lecture itself, I called attention.

As regards holly leaves, Mr. Henslow denies my statement, and questions my explanation. With reference to the fact, I should have thought there was no question. It has been stated over and over again in standard works. Sir J. D. Hooker in the "Student's Flora," for instance, says that the leaves are spinous, adding, those on the upper branches often entire." This is entirely in accordance with my own experience. Next, as to the explanation. Mr. Henslow observes that it "seems to be attributing to the holly a very unexpected process of ratiocination." Surely, however, this would apply to any explanation, and in this world there must be some cause for everything. Mr. Henslow would not maintain that the pitchers of pitcher plants imply any process of ratiocination?

Mr. Henslow's next point is with reference to fleshy leaves, and he observes that, "Surely the usual explanation that it is this thick cuticle which prevents rapid exhalation is a better reason." A better reason for what? I was not speaking of the thickness of the cuticle but of the unusual development of the parenchymatous tissue.

Again, he questions whether "cut-up" leaves present a greater extent of surface in proportion to their mass, but surely he cannot seriously deny this.

Lastly, he doubts whether it is an advantage to water-ranunculi to have filiform leaves, because he saw a pond last summer which was dried up, and yet covered with a "carpet composed of the erect filiform branchlets of the cut-up leaves of *Ranunculus aquatilis*." But it does not follow that a plant placed in an abnormal situation should at once alter its habit, any more than an individual duck would lose its webbed feet because it was kept from water. Any one who will take an ordinary plant of *R. aquatilis* out of water will see at once that the leaves cannot support themselves.

I admit that my suggestions require more evidence than can be given in a single lecture, and I shall hope to develop them at greater length elsewhere; but in the mean time, though I think that Mr. Henslow's criticisms admit of answer, I am much obliged for his suggestions.

JOHN LUBBOCK

Aurora at Christiania

ON the evening of March 15 an aurora appeared of unusual proportions for our part of the country. It was seen for the first time at 7.45, and then consisted of diffused and faint arches high on the northern sky. By degrees its sphere extended, and

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at 8.30 it reached the zenith. In this position—from the northern horizon to zenith—the phenomenon remained almost uninterrupted all the following time. The light was rather feeble, and in the beginning the motions were insignificant. But at 10 o'clock the peculiar blazing or undulating movement that is designated by the name of *coruscation*, began to be seen, and during four hours and a half at least the whole northern half of the sky was the theatre of this uncommonly violent chase of the luminous clouds. The culmination of the aurora happened at 10.30, when on the northern sky advanced a series of splendid streamers, the inferior points of which played in red and green. This radiance was only of short duration, and later there appeared in the north only arches more or less distinct; while on the higher parts of the heavens the chasing flames incessantly continued their playing. Still, so late as 14.30 saw the flames as far as to the zenith with unimpaired violence.

I may add that on this occasion I succeeded in what I myself, as well as other friends of the aurora, have tried before in vain, viz. *to get the aurora to make impression on a photographic plate.* I exposed in all five plates; of these four (for times of exposure of 2-4 minutes) without the least trace of action, but the fifth, which was exposed during 8½ minutes, shows both a part of the horizon with a high church spire and a feeble representation of a portion of the aurora. I must, however, state that this portion in itself was but very feebly illuminated, and that at the time when the phenomenon developed the greatest power of light I was prevented from applying the camera.

The object-glass employed was: Voigtländer euroscope, No. 1; Schleussner's dry plates.

Also on the 16th, in the evening, 8.45 to 10, there appeared an aurora, but consisting essentially only of feeble fragments of arches rather low on the northern sky. The aurora has in recent times been astonishingly rare: here in Christiania, in the course of the whole winter, it has been observed on the following days:—September 14, 17, 24; October 14, 15; November 17; December 22; January 22; February 14, 16; March 12, 15, 16.

March 15 excepted, all these auroræ have been rather insignificant. SOPHUS TROMHOLT

Christiania, March 17

"Peculiar Ice Forms"

UNDER the above caption, several correspondents of NATURE have recently described and discussed the agglutinated filamentoid ice-crystals commonly extruded from unfrozen earth under suitable conditions of moisture and temperature. B Woodd Smith records their occurrence in the Savoyan Alps (his language implying variety of the phenomena there), and attributes them to the linear expansion incident to congelation of capillary columns of water in a thin sheet of soil resting upon rock (vol. xxxi. pp. 5-6). W. alludes to such crystals in general terms, refers to a previous notice of similar phenomena, and (erroneously) allies them genetically to hoar-frost (*ib.*, p. 29). Dr. John Rae discusses distinct (but erroneously supposed similar) phenomena at length, and argues that the several strata of crystals are remnants of successive sheets of ice or snow (*ib.*, pp. 81-2). Mr. Smith then controverts Mr. Rae's explanation, maintains his own, and refers to several earlier communications in NATURE relating to filamentoid ice-crystals (*ib.*, pp. 193-4); and sebsequently he transmits a letter from John D. Paul, who has essentially repeated his own observations in the Alps (*ib.*, p. 264).

Now that it has become fashionable to revive forgotten records, it may be pointed out that these correspondents ignore the more valuable portion of the literature of their subject. Even in NATURE discussion of the fibrous ice-crystals extruded from moist earth, wet wood, &c., was epidemic fifteen years ago, and again ten years later, besides the sporadic cases of three years ago, as shown in the following bibliography:—

1870	Vol. I.	—C. Spence Bate	p. 556
,,	,,	—Mr. Pengelly	p. 627
,,	Vol. II.	—T. G. Bonney, John Langters (*sic*)	pp. 141-2
1871	Vol. III.	—T. G. Bonney, John Langton	pp. 105-7
,,	,,	—T. G. Bonney	p. 288
1880	Vol. XXI.	—Argyll	p. 274
,,	,,	—R. Meldola	p. 302
,,	,,	—Argyll	p. 368
,,	,,	—O. Fisher	p. 396
1880	Vol. XXI.	—D. Wetterhan	p. 396
,,	,,	—L. Bleekrode	p. 444
,,	,,	—S. T. Barrett	p. 537
,,	,,	—Wm. Le Roy Broun	p. 589
,,	Vol. XXII.	—John Le Conte	p. 54
,,	,,	—R. H.	pp. 145-6
1882	Vol. XXV.	—J. F. Duthie	p. 78
,,	Vol. XXVI.	—H. Warth	p. 81

The second outbreak was practically terminated by the communications of Profs. Broun and Le Conte. The first of these gentlemen wrote from a locality in which the phenomena are readily observable, while the latter called attention to his own elaborate researches of thirty years before (*Proc. Am. Assn. Adv. Sci.*, iii. 1850, p. 20-34; *Phil. Mag.*, third series, xxxvi. 1850, pp. 329-42).

More recently (February 6, 1884) Prof. Schwalbe has placed before the Physical Society of Berlin the results of his observations upon filamentoid ice-crystals in the Harz. After thorough study he accepts Le Conte's views as to their genesis.

Prof. Le Conte's explanation (which is essentially identical with that subsequently offered independently by Prof. Broun) is as follows:—"Let us suppose a portion of tolerably compact porous and warm earth saturated with moisture, to be exposed to the influence of a cold-producing cause. The soil being an imperfect conductor of heat, only a very superficial stratum would be reduced to the freezing point. As the resistance to lateral expansion is less at the surface than it is at] a sensible depth below, the effect of the first freezing would be to render the apices of the capillary tubes or pores conical or pyramidal. The sudden congelation of the water, filling the conical capillaries in the superior stratum, would produce a rapid and forcible expansion, which, being resisted by the unyielding walls of the cone, would not only protrude, but *project* or *detach and throw out* the thread-like columns of ice, in the direction of *least resistance*, or perpendicular to the surface. This would leave the summits of the tubes *partially empty*—a condition essential to the development of capillary force. Under these circumstances capillary attraction would draw up warm water from beneath, which, undergoing congelation, would, in like manner, elevate the column of ice still higher; and thus the process would go on as long as the cold continued to operate on unobstructed capillaries, supplied with sufficient water from below. It will be remarked that this explanation makes the whole process of protrusion to take place in a stratum of earth of almost inappreciable thickness. It also presumes that the protruding force act[s] *paroxysmally*" (*Proc. Am. Assn. Adv. Sci.*, *op. cit.*, 30-31). He subsequently remarks (NATURE, *op. cit.*): ". . . In relation to the explanation of the phenomena, I have nothing to add to that given" above, "except in relation to *two points*, viz.: (1) that I did not sufficiently *emphasise* the importance of the fact that the water contained in the *capillary* tubes in the upper stratum of earth is cooled many degrees below the freezing temperature; and (2) that consequently the congelation would necessarily take place *paroxysmally.*"

It may be pointed out also that the great majority of the correspondents, both recent and earlier, base their explanations upon isolated observations of phenomena rare in their localities. In reality the extrusion of filamentoid ice-crystals is even more common in certain localities than is indicated by Le Conte's papers and Broun's letter. Thus, in the cultivated fields of the Mississippi valley, during a cloudy day following an autumnal rain, with an air temperature just below freezing-point, the writer has seen a thin layer of soil elevated from one to three inches over fully four-fifths of the area visible from the road throughout a day's journey. Greater length is sometimes attained by the crystals. Within a week the writer has observed, along the roadsides just beyond the limits of Washington, many irregular patches and belts of straight or slightly curved filamentoid crystals, four, six, and even eight inches in height. They were sometimes highest where they supported the greatest weight of earth, leaves, twigs, or pebbles upon their summits. In one case a worn quartzite pebble 1 × 1½ × 2⅛ inches was hoisted on a slender tuft of icy needles six or seven inches long, fully two inches above the smaller neighbouring pebbles and the film of soil in which it had been imbedded.

While Le Conte's theory of the formation of the filamentoid crystals extruded from moist earth or wet vegetal stems is acceptable in a general way, repeated observation upon crystals apparently in process of development has convinced the writer that their growth is not paroxysmal. The effect of capillarity

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